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(54) **Heater unit structure of air mixing apparatus for automotive vehicle.**

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EP 0 458 705 B1

Description

The present invention relates to a heater unit structure arrangement for an air mixing apparatus for an automotive vehicle, such as disclosed in the general part of the generic claim.

A conventional heater unit structure arrangement of this kind is shown on figure 1A. This heater unit structure arrangement includes a core case 101 having a heating heat exchanger 103 (e.g. heater core), and an air distribution case 105 connectable to a vent duct 107, a defroster duct 109, and a foot duct 111, respectively. Two side vent ducts 113 extending between the driver seat side and the front passenger seat side are usually formed integral with the vent duct 107. Therefore, when the vent door 115, the defroster door 117 and the foot door 119 are pivoted from the respective solid line positions to the respective dot-dot-dashed line positions or vice versa, well mixed air can be selectively blown out through the respective blowing outlets of the respective ducts 107, 109, 111 and 113, as disclosed in Japanese Published Unexamined (Kokai) Patent Appli. No 62-286823, for instance.

In the prior-art heater unit structure, the assembly procedure is as follows : the heater unit is fixed to the vehicle body ; the respective ducts 107, 109 and 111 are attached to the distribution case 105 ; the instrument panel 127 is fixed to the vehicle body ; and the defroster ducts 109 are finally attached to opening portions 129 of the instrument panel 127.

In the above-mentioned prior-art heater unit, however, since the side vent duct 113 is formed integral with the vent duct 107 in such a way as to extend to the driver seat side as shown in Fig. 1B, there exists a problem in that a post bracket 123 for supporting a steering member 121 extending in the vehicle transversal direction interferes with the side vent duct 113 extending to the driver seat side, and therefore the side vent duct 113 becomes complicated in shape because the side vent duct 113 must be arranged through a space enclosed by the post bracket 123, a steering member 121, and a steering column 125.

Accordingly, although the assembly work can be completed by attaching the respective ducts 107, 109, and 111 to the distribution case 105 before attaching the instrument panel 127, there exists a problem in that it takes much time to attach each duct one by one to the distribution case 105 and therefore the assembly productivity is extremely low. In addition, since the instrument panel 127 is large in size and therefore easily deformable in shape, a troublesome assembly work is required to fit a blowing outlet 131 of the defroster duct 109 (for blowing out air toward the

windshield 133) to the opening portion 129 of the instrument panel 127. In this assembly work, if the respective ducts 107 and 109 can be previously attached to the instrument panel 127, it may be possible to improve the workability of duct assembly between the blowing outlets 131 of the defroster ducts 109 and the openings 129 formed in the instrument panel 127. In this case, however, since the side vent duct 113 formed integral with the vent duct 107 and extending to the driver seat side is complicated in shape, there exists a problem in that it is impossible to previously attach the respective ducts 109 and 107 to the instrument panel 127. The above-mentioned problem is serious in particular, when the heater unit is mounted on a vehicle body in a full automatic assembly process line.

With these problems in mind, therefore, it is primary object of present invention to provide a heater unit structure of an air mixing apparatus for an automotive vehicle which can improve the workability of the various duct assembly to the vehicle.

To achieve the above-mentioned object, the heater unit structure arrangement proposed by the invention comprises the features which are set forth in the characterizing part of the generic claim.

Also, for achieving the above-mentioned object, the method for establishing the heater unit structure arrangement according to claim 1, the method proposed by the invention includes the features which are set forth in the characterizing part of claim 2.

In the present unit structure and the method according to the present invention, since the guide duct connectable to a side vent duct formed into a complicated shape and extending to the driver seat side is formed integral with the distribution case and therefore the complicated-shape side vent duct is connected to the distribution case via the guide duct, it is possible to previously attach the vent duct extending to the front passenger seat side and the defroster ducts to the instrument panel, so that workability of various duct assembly can be improved markedly. In addition, since the vent duct and the defroster ducts can be previously and securely connected to the instrument panel, it is possible to prevent air leakage through the connecting portions between the two.

It results from the foregoing that the invention such as disclosed in claims 1 and 2 does not result in obvious manner from the prior art heater unit structure arrangement according to figure 1A. The invention does also not follow in obvious manner from the U.S. Patent 4 615 262 which relates also to a heater unit structure arrangement. However, this latter known heater unit structure arrangement does not comprise side vent ducts and therefore does not concern the problem of the invention. It

does not teach or even suggest the features of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1A is a cross-sectional side view showing a prior-art air mixing apparatus, in which R-F indicates the vehicle front-rear direction;

Fig. 1B is a cross-sectional view showing the side vent duct of the prior-art apparatus arranged extending to the driver seat side;

Fig. 2 is an exploded view showing the air mixing apparatus for an automotive vehicle according to the present invention;

Fig. 3 is a cross-sectional side view of the heater unit shown in Fig. 2, taken along the vehicle transversal direction, in which L-R indicates the vehicle left-right direction;

Fig. 4 is a cross-sectional side view of the heater unit shown in Fig. 2, taken along the vehicle longitudinal direction; and

Fig. 5 is a cross-sectional top view of the heater unit shown in Fig. 2, taken along the vehicle transversal direction.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

An embodiment of the present invention will be described hereinbelow in detail with reference to Fig. 2 to 5. Fig. 2 is an air mixing apparatus for an automotive vehicle, which comprises a blower unit 1, a cooling unit 3, and a heater unit 5. The blower unit 1 is provided with a motor fan (not shown), an outside air introducing port 7 for introducing outside air into the vehicle room by the motor fan, and an inside air introducing port 9 for introducing vehicle inside air thereinto by the motor fan. The respective ports 7 and 9 can be closed or opened by a pivotal flapper 11 actuated in response to a change-over mode switch (not shown). In more detail, when the pivotal flapper 11 is pivoted upward at the dot-dot-dashed line, since the outside air introducing port 7 is closed, the inside air introducing port 9 is full opened. On the other hand, when the pivotal flapper 11 is pivoted downward at the dashed line, since the inside air introducing port 9 is closed, the outside air introducing port 7 is full opened. Further a cooling heat exchanger (not shown) such as evaporator is provided within the cooling unit 3, and the heater unit 5 is connected to the downstream side of the cooling heat exchanger.

The heater unit 5 is formed with a core case 15 for housing a heater core 13 and a distribution case 17 communicating with the core case 15, as shown in Fig. 4.

An air mix door 19 (shown in Fig. 5) is disposed on the upstream side of the heater core 13 through which coolant of an engine (not shown) is passed. The coolant temperature increases with increasing engine temperature.

When an air mix door 19 is located at the solid line position (in Fig. 5), air cooled through the cooling heat exchanger flows without being passed through the heater core 13; on the other hand, when the air mix door 19 is located at the dot-dot-dashed line position, air cooled through the cooling heat exchanger flows passing through the heater core 13. Accordingly, the amount of air passed through the heater core 13 can be adjusted according to the opening rate (pivotal position) of the air mix door 19, and the mixed air flows into the distribution case 17.

The distribution case 17 is formed with first and second upper duct connecting ports 25 and 27 connectable to a side vent duct 21 extending to the front passenger seat side and two defroster ducts 23, respectively on the upper surface thereof. Further, the distribution case 17 is formed with a third duct connecting port 31 connectable to a bifurcated rear duct 29 and a foot blowing port 33, on the lower part thereof. Therefore, when a defroster door 30, a door 32 and a foot door 34 are pivoted from the respective solid line positions to the dot-dot-dashed line positions or vice versa in Fig. 4, it is possible to control the amount of air passed through the respective ducts 23, 21 and 29, in various combination modes.

Further, the air mix door 19 can be controllably pivoted in response to signals from an inside-outside temperature selecting switch; and the defroster door 30, the vent door 32 and the foot door 34 can be controllably provided in response to signals from a blower port selecting switch.

Further, the distribution case 17 is formed with a guide duct 37 connectable to a side vent duct 35 extending to a driver seat side and fixed to the vehicle body. As shown-in Fig. 3, since the side vent duct 35 is disposed so as to extend under the post bracket 39, the guide duct 37 is formed into a curved shape extending from the upper opening 37a to the lower side thereof so as to be connectable to the side vent duct 35.

The upper opening 37a of the guide duct 37 is formed side by side with the first duct connecting port 25. Therefore, when the vent duct 21 is connected to the first duct connecting port 25 of the distributing case 17, the upper opening 37a of the guide duct 37 communicates with the duct 21, so that mixed air flows into the guide duct 35 via the vent duct 21 as shown by thick curved line in Fig. 3.

On the other hand, the vent duct 21 is formed with two center vent blowing outlets 41 and a

connecting port 45 connected to a side vent duct 43 extending to the front passenger seat (the leftward side in Fig. 2). The vent duct 21 and the side vent duct 43 and further the defroster ducts 23 are all previously attached to the inside surface of the instrument panel 47 with respective brackets 21a, 23a, and 43a, respectively. In this case, each blowing outlet 23b of each defroster duct 23 is securely located and connected to the opening 47a of the instrument panel 47 as shown in Fig. 4. Further, in Fig. 4, 49 denotes a front windshield and 51 denotes a sealing urethane sandwiched between the distributing case 17 and the defroster duct 23.

In the heater unit structure constructed as described above, the assembling procedure is as follows: the heater unit 5 is fixed to the vehicle body; the side vent duct 35 on the driver seat side is connected to the guide duct 37 of the distributing case 17 and fixed to the vehicle body; the vent duct 21 and the two defroster ducts 23 are previously connected to the instrument panel 47; the instrument panel 47 is temporarily mounted on the vehicle body; the vent duct 21 and the two defroster ducts 23 connected to the instrument panel 47 is fitted from above to the first and second duct connecting ports 25 and 27 of the distributing case 17, and the instrument panel 47 is fixed to the vehicle body. Therefore, it is possible to simultaneously connect the side vent duct 43 and the vent duct 21 and the two defroster ducts 23 to the heater unit 5 simultaneously when the instrument panel 47 is fixed to the vehicle body.

Further, it is possible to eliminate the work of fitting the blowing ports 23b of the defroster duct 23 to the opening 47a of the instrument panel 47 after the instrument panel 47 has been fixed to the vehicle body. Further, since the defroster ducts 23 are connected to the connecting ports 27 of the distributing case 17 via the sealing urethane 51, it is possible to blow out mixed air from the blowing outlet 23b of the defroster ducts 23 toward the windshield 49 effectively, without leakage through the connecting portions.

As described above, in the heater unit structure according to the present invention. Since the distributing case 17 is formed with the curved guide duct 37 connectable to the driver-side vent duct, it is possible to previously attach the passenger-side vent duct and the defroster ducts to the instrument panel, thus it being possible to markedly improve the workability of the duct assembly.

Further, since the blowing outlets of the defroster ducts can be previously and securely attached to the instrument panel, it is possible to effectively blow out air without leakage through the connection portions of the blowing outlets.

Claims

1. A heater unit structure arrangement for an air mixing apparatus for an automotive vehicle, comprising :

a core case (15) for housing a heater core (13) ; a distribution case (17) communicating with said core case (15) and formed therewith, a first side vent duct (21) fixed to an instrument panel (47) of the said vehicle, a second side vent duct (35) fixed to the vehicle body and at least one defroster duct (23) fixed to the instrument panel (47) and connecting means for connecting said distribution case to said ducts, characterized in that said connecting means comprise a vent duct connecting port (25) formed on an upper surface of said distribution case (17) and connectable to said first side vent duct (21) fixed to said instrument panel (47), at least one defroster duct connecting port (27) formed on the upper surface of said distribution case (17) and connectable to said at least one defroster duct (23) also fixed to said instrument panel and a guide duct (37) connectable to an upper opening (37a) of the distribution case (17) and having a curved shape extending to the lower side of said distribution case so as to be connectable to said first vent duct (21), said upper opening (37a) communicating with said first vent duct (21) on the upper surface of said distribution case.

2. A method for establishing said heater unit structure arrangement according to claim 1, comprising the steps of:

(a) fixing said core case (15) formed with said side vent duct connecting port (25), said at least one defroster duct connecting port (27) and said guide duct (37), to the body of the vehicle ;
 (b) connecting said side vent duct (35) extending to a driver seat side to the guide duct (37) ;
 (c) fixing said side vent duct (35) extending to the driver seat side to the vehicle body ;
 (d) fixing said side vent duct (21) extending to a front passenger seat side and said at least one defroster duct (23) to said instrument panel (47) ;
 (e) fitting said side vent duct (21) and said defroster duct (23) already fixed to said instrument panel (47) to the vent duct connecting port (25) and the defroster duct connecting port (27), and
 (f) fixing the instrument panel (47) to the vehicle body.

Patentansprüche

1. Heizungseinheitsstruktur einer Luftmischungs-
vorrichtung für ein Kraftfahrzeug, mit :
einem Kerngehäuse (15) zur Aufnahme eines
Heizungskernes (13) ; einem Verteilergehäuse
(17), das mit dem genannten Kerngehäuse (15)
in Verbindung steht und an diesem angeformt
ist, einer ersten seitlichen Entlüftungsleitung
(21), die an einer Instrumententafel (47) des
Fahrzeuges befestigt ist, einer zweiten seitli-
chen Entlüftungsleitung (35), die am Fahrzeug-
körper befestigt ist und mit wenigstens einer
Entfrosterleitung (23), die an der Instrumen-
tentafel (47) befestigt ist, und mit Verbindungs-
mitteln zur Verbindung des genannten Vertei-
lergehäuses mit den genannten Leitungen,
dadurch gekennzeichnet, dass die genannten
Verbindungsmitteln eine Entlüftungsleitungs-
verbindungsöffnung (25), die in einer oberen
Fläche des genannten Verteilergehäuses (17)
ausgebildet und mit der an der genannten In-
strumententafel (47) befestigten ersten Entlüf-
tungsleitung (21) verbindbar ist, wenigstens
eine Entfrosterleitungsverbindungsöffnung (27),
die auf der oberen Fläche des genannten Ver-
teilergehäuses (17) ausgebildet und mit der
ebenfalls an der Instrumententafel befestigten
wenigstens einen Entfrosterleitung verbindbar
ist, und eine Führungsleitung (37) besitzt, die
mit einer oberen Öffnung (37a) des Verteiler-
gehäuses (17) verbindbar ist und eine ge-
krümmte Form hat, die sich zum unteren Ende
des genannten Verteilergehäuses hin so er-
streckt, dass sie mit der genannten ersten Ent-
lüftungsleitung (21) verbindbar ist, wobei die
genannte obere Öffnung (37a) mit der genann-
ten ersten Entlüftungsleitung (21) auf der obern
Fläche des genannten Verteilergehäuses in
Verbindung steht.
2. Verfahren zur Herstellung der Heizungsein-
heitsstruktur nach Anspruch 1, mit den Arbeits-
schritten zur :
(a) Befestigung des genannten Kerngehäu-
ses (15), das mit der genannten seitlichen
Entlüftungsleitungsverbindungsöffnung (25),
der genannten wenigstens einen Entfroster-
leitungsverbindungsöffnung (27) und der
genannten Führungsleitung (37) ausgebildet
ist, an dem Körper des Fahrzeuges ;
(b) Verbindung der genannten seitlichen
Entlüftungsleitung (35), die sich zur Fahrer-
sitzseite hin erstreckt, an der Führungslei-
tung (37) ;
(c) Befestigung der genannten seitlichen
Entlüftungsleitung (35), die sich zur Fahrer-
sitzseite hin erstreckt, an dem Fahrzeugkör-

per ;

(d) Befestigung der genannten seitlichen
Entlüftungsleitung (21), die sich zu einer
vorderen Passagiersitzseite und der ge-
nannten wenigstens einen Entfrosterleitung
(23) hin erstreckt, an der genannten Instru-
mententafel (47) ;

(e) Einpassung der genannten seitlichen
Entlüftungsleitung (21) und der bereits an
der genannten Instrumententafel (47) befe-
stigten Entfrosterleitung (32) in die Entlüf-
tungsleitungsverbindungsöffnung (25) und
der Entfrosterleitungsverbindungsöffnung
(27), und

(f) Befestigung der Instrumententafel (47)
am Fahrzeugkörper.

Revendications

1. Agencement formant structure de l'unité de
chauffage d'un appareil pour mélanger l'air
pour un véhicule automobile, comprenant :
un boîtier de noyau (15) pour loger un noyau
chauffant (13); un boîtier de distribution (17)
communiquant avec ledit boîtier de noyau (15)
et réalisé en une pièce avec celui-ci, un pre-
mier conduit latéral d'aération (21) fixé à un
tableau de bord (47) dudit véhicule, un deuxiè-
me conduit latéral d'aération (35) fixé à la
caisse de véhicule et au moins un conduit
dégivreur (23) fixé au tableau de bord (47) et
des moyens de connexion pour relier ledit
boîtier de distribution auxdits conduits,
caractérisé en ce que lesdits moyens de
connexion comprennent un orifice de
connexion de conduit d'aération (25) formé sur
une surface supérieure dudit boîtier de distri-
bution (17) et pouvant être relié audit premier
conduit latéral d'aération (21) fixé audit tableau
de bord (47), au moins un orifice de connexion
de conduit dégivreur (27) formé sur la surface
supérieure dudit boîtier de distribution (17) et
pouvant être relié audit au moins un conduit
dégivreur (23) fixé également audit tableau de
bord et un conduit de guidage (37) pouvant
être relié à une ouverture supérieure (37a) du
boîtier de distribution (17) et ayant une forme
courbée s'étendant vers le côté inférieur dudit
boîtier de distribution de façon à pouvoir être
relié audit premier conduit d'aération (21), ladi-
te ouverture supérieure (37a) communiquant
avec ledit premier conduit d'aération (21) sur la
surface supérieure dudit boîtier de distribution.
2. Procédé pour établir ledit agencement formant
structure de l'unité de chauffage selon la re-
vendication 1, comprenant les étapes consis-
tant à :

- (a) fixer ledit boîtier de noyau (15) présentant ledit orifice de connexion de conduit latéral d'aération (25), ledit orifice de connexion (27) dudit au moins un conduit dégivreur et ledit conduit de guidage (37), à la caisse du véhicule; 5
- (b) relier ledit conduit latéral d'aération (35) s'étendant vers un côté du siège du conducteur au conduit de guidage (37);
- (c) fixer ledit conduit latéral d'aération (35) s'étendant au côté du siège du conducteur à la caisse de véhicule; 10
- (d) fixer ledit conduit latéral d'aération (21) s'étendant vers un côté de siège de passager avant et ledit au moins un conduit dégivreur (23) audit tableau de bord (47); 15
- (e) adapter ledit conduit latéral d'aération (21) et ledit conduit dégivreur (23) déjà fixé audit tableau de bord (47) à l'orifice de connexion (25) du conduit d'aération et à l'orifice de connexion (27) du conduit dégivreur et 20
- (f) fixer le tableau de bord (47) à la caisse de véhicule.

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FIG. 1A
PRIOR ART

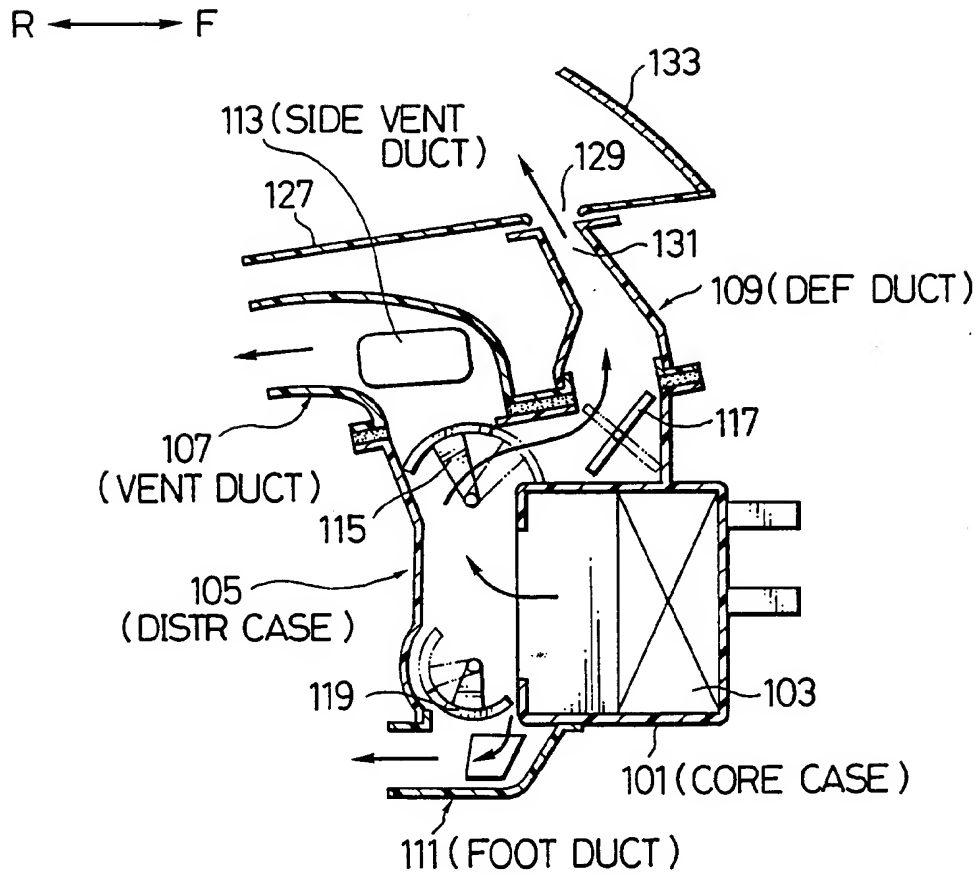
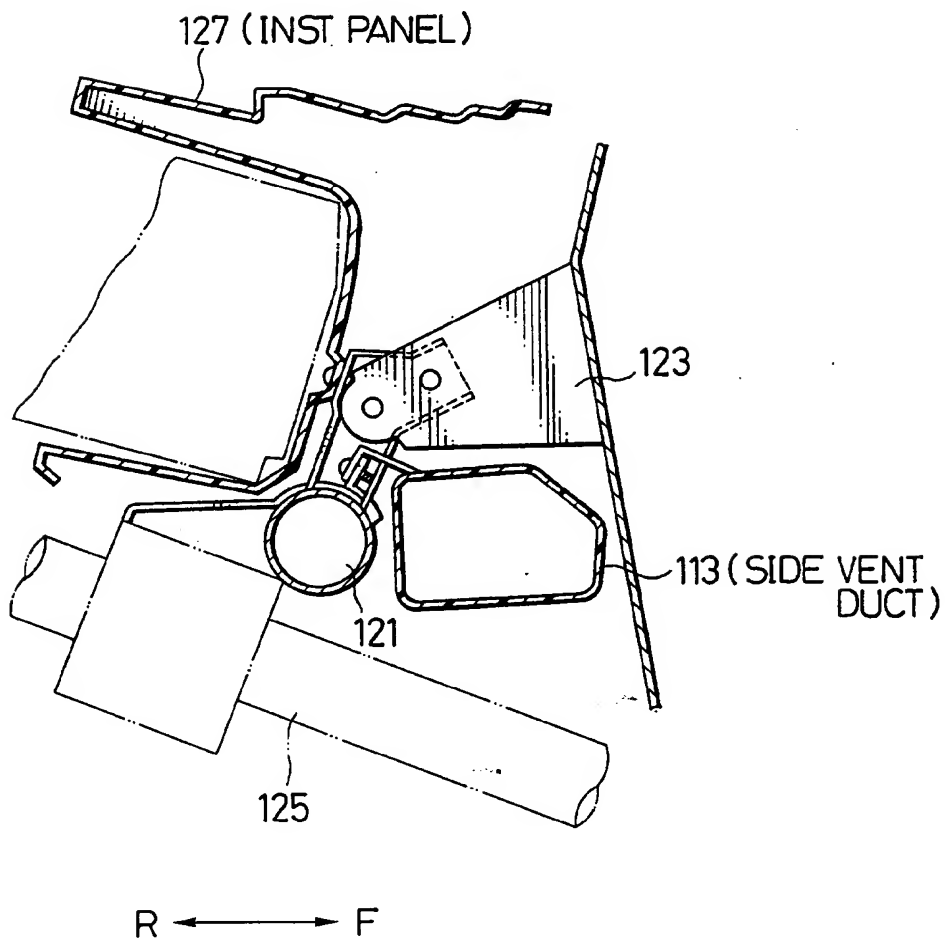


FIG. 1B
PRIOR ART



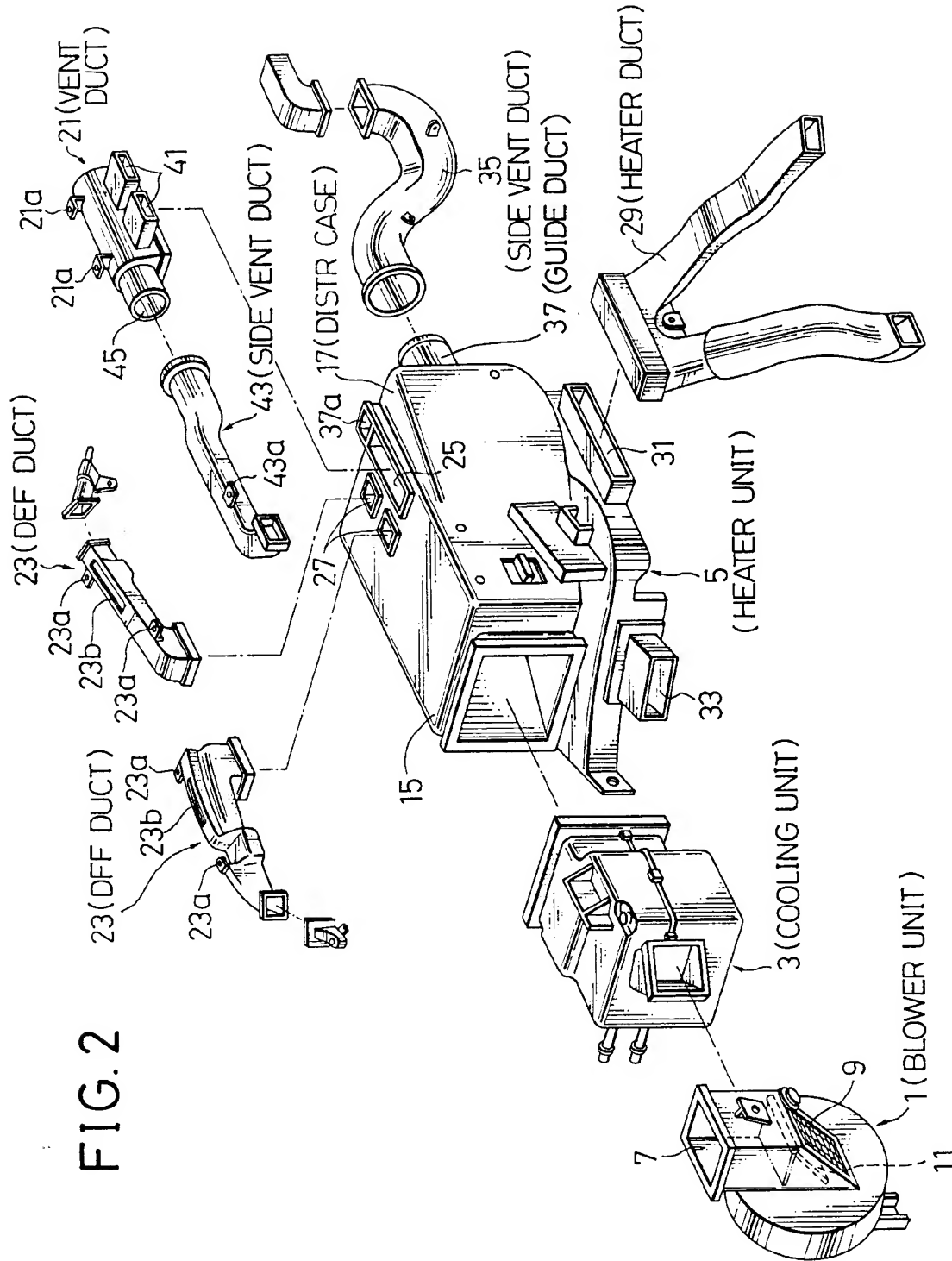


FIG. 3

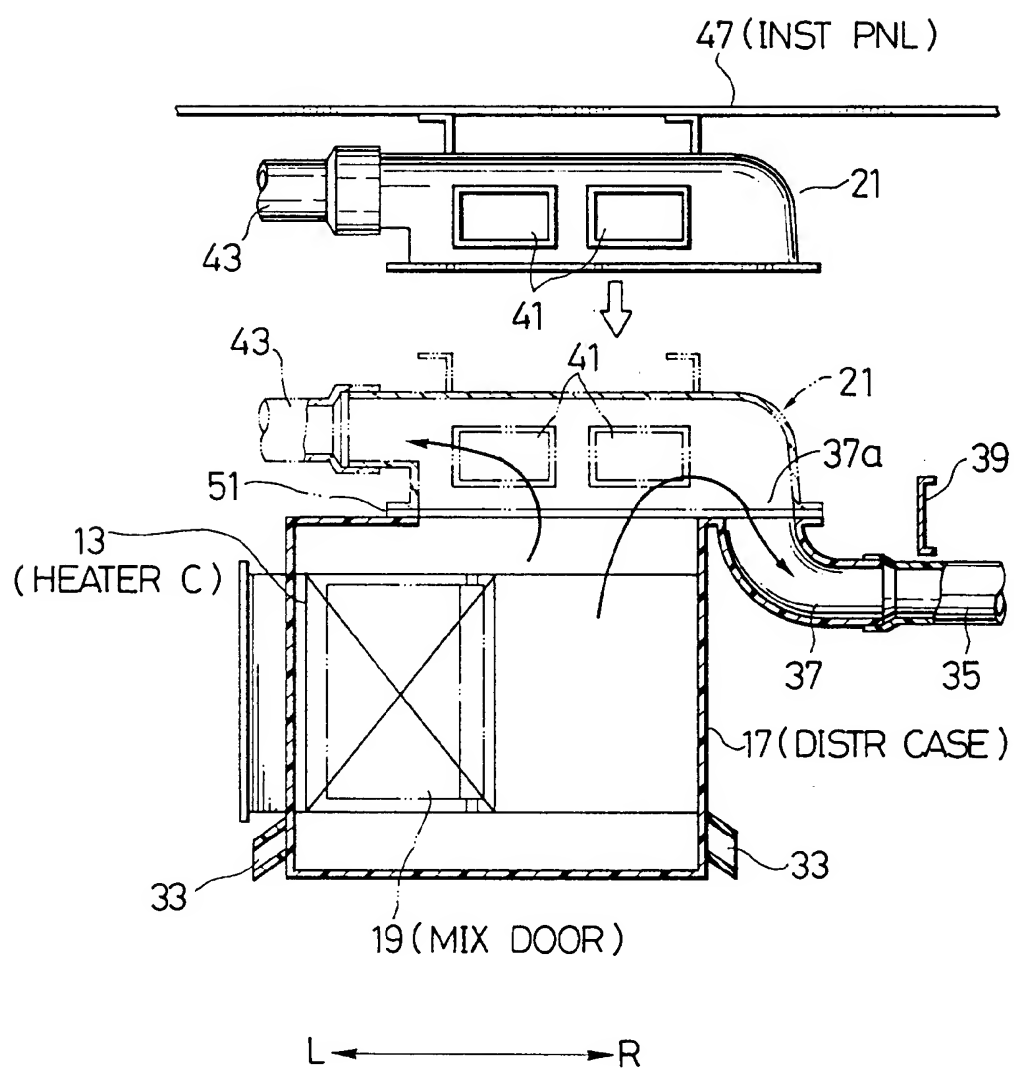


FIG. 4

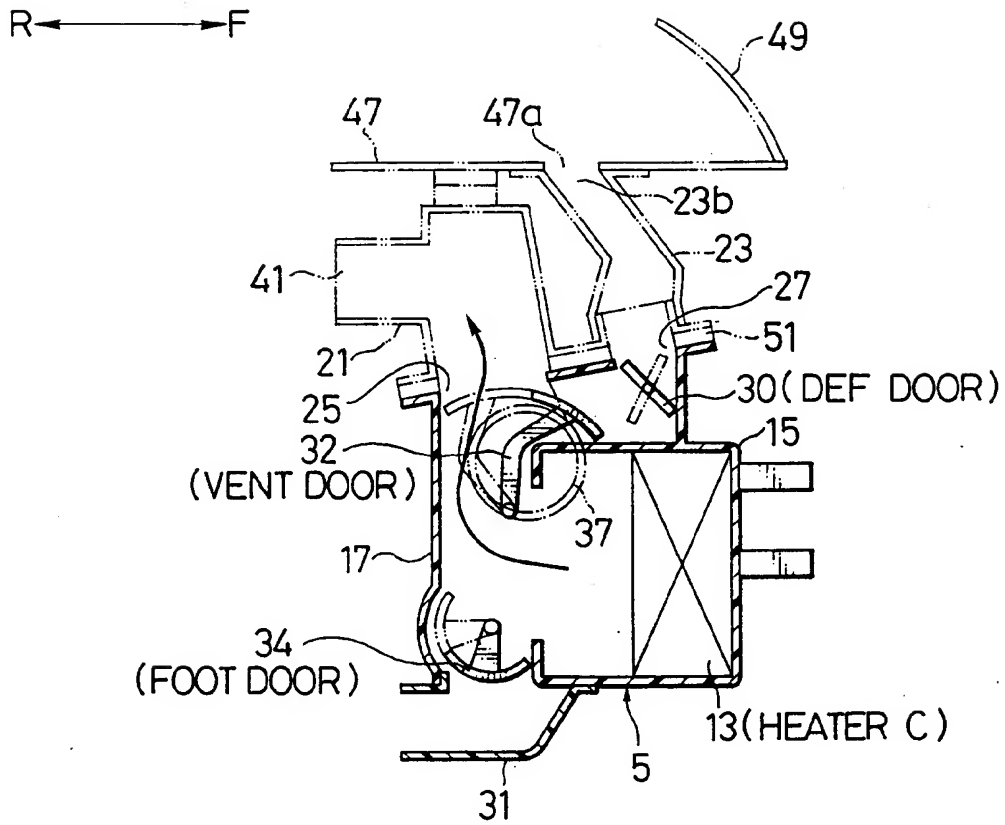


FIG. 5

